CHAPTER 5
Habitat Assessment

Introduction

A habitat assessment is an important step in tracking changes within the stream over time. Changes that take place slowly have a way of escaping our attention until the changes are dramatic in scope. How many of us remember our grandparents or other elders saying, "I remember what this stream looked like when I was a kid"? Even though these accounts are useful and entertaining, proper management of natural resources takes solid data and observations to document what's going on within a natural system. Even with these, it's still difficult to determine cause and effect within a complex natural system.

These observations need only be measured and recorded *once a year*, preferably in the summer, unless there is some significant land-use change that may affect stream characteristics in a very short period of time. Examples of this might be stream channelization, a large industrial development or housing development in a short period of time, or a catastrophic natural event such as a flood. In such cases, a second habitat assessment would be valuable.

Stream Transect and Stream Reach

Observations and parameters measured throughout the IOWATER assessments are done at two scales, the **stream transect** and the **stream reach**. A stream transect is the exact location across the stream that you are going to monitor. This is the location you want your UTM coordinates to pinpoint. The stream reach is defined as one set of riffle, run, and pool habitats. However, riffle, run, and pool habitats may not be present at all monitoring sites. In this case, you should define your stream reach as a set distance (25 meters upstream and 25 meters downstream) from your transect.

Measuring depth at the stream transect

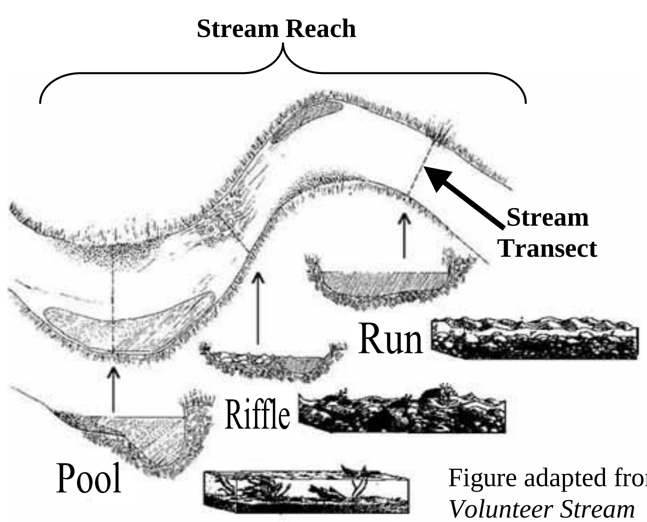


Figure adapted from: *Volunteer Stream Monitoring: A Methods Manual*. EPA 841-B-97-002

The level at which observations or measurements are made is outlined in the *Reporting Technique* section for each parameter.

Stream Habitat Type

A variety of habitats within a stream usually enhances the **diversity** of aquatic life that you may find there. Stream habitats are divided into three main types: riffles, runs, and pools. Healthy streams show alternating pool and riffle areas while lower quality streams generally consist of long, continuous runs.

A **riffle** is an area of the stream that has a swift moving current and water that is normally "bubbling" due to a rocky streambed. This habitat type promotes relatively high dissolved oxygen levels as the water tumbles over and around the rocks. Riffles typically have high numbers of **invertebrates** and the small fish that feed on them.

A **run** can be characterized as having a moderate current, medium depth, and a smooth water surface. Runs can have diverse mixtures of aquatic life, depending on the quality and quantity of the in-stream habitat (boulders, logs, root wads, etc.).

A **pool** has a relatively slow current and is usually found at stream channel bends, upstream of riffles, or on the downstream side of obstructions such as boulders or fallen trees. The stream bottom in a pool is often bowl shaped. Pools are great areas for fish such as bass, catfish, northern pike, and trout.

Reporting Technique: Check the habitat type that best describes your *stream transect*.

Streambed Substrate

The characteristics of the stream bottom are very important to habitat quality and the type of aquatic life you may find there. In general, a shifting sand or silt streambed will not support as diverse a population as more stable streambeds consisting of cobble, boulders, or fallen trees.

What a streambed is made up of is called the **substrate**. Although natural **geology** is responsible for the original substrate of Iowa streams, effects of human activities in the watershed, such as those that increase soil erosion rates, can cover the existing substrate with a layer of sand or silt. This covering of the original substrate is called embeddedness and it reduces biodiversity by destroying aquatic habitats. Fish and invertebrates need spaces between rocks where they can hide from **predators**, lay their eggs, and feed upon their favorite source of food. Algae and aquatic plants need a stable substrate to which they can attach.

Substrates are typed by size as follows:

- **Bedrock** - large sheets of stone
- **Boulder** - stones larger than 10 inches in diameter
- **Cobble** - stones with a diameter between 2.5 and 10 inches
- **Gravel** - 0.1 to 2 inch diameter
- **Sand** - smaller than 0.1 inches
- **Mud** / **Silt** - dirt or soil deposited on the bottom of the stream
- **Other** - organic material like **leaf litter**, tree limbs, etc.

Bedrock – large sheets of rock

Boulders – larger than 10 inches

Reporting Technique: At the *stream transect*, estimate the percent area of the bottom of the streambed covered by each of the above. These should add up to 100% of the streambed substrate.

Test Yourself – What Substrates do you see?

Microhabitats

Smaller habitat areas, called **microhabitats**, exist within the larger stream habitat types (riffles, runs, or pools). These microhabitats consist of algae mats, **leaf packs**, logjams, rocks, root wads, undercut banks, fallen trees, weed beds (aquatic vegetation), silk/muck, sand, junk (tires, garbage), rip rap, overhanging vegetation and large rocks. Microhabitats ensure stream diversity by supporting a variety of aquatic life.

Algae Mats

Weed Beds / Aquatic Vegetation

Overhanging Vegetation

Logjam

Rip Rap

Rocks

Rootwad

Silt & Muck

Leaf pack

Junk

Fallen Tree Undercut Bank

Reporting Technique: Record all of the different types of microhabitats that you see in your *stream reach*. Describe them as best as possible.

Test Yourself- How many microhabitats do you see?

Stream Banks

The shape and condition of stream banks can provide insight into the quality of the stream and the aquatic life it can support. Are the banks high crumbling walls or gently sloping banks with grass, shrubs, and trees growing on them? You can tell much about the stream's long-term stability by looking at the shape and condition of its banks.

A stable bank is a sign of a **stable stream**. All streams and rivers move within their **floodplains**, but a mature, stable stream will not move very rapidly. Bank sloughing, cut banks, and high-wall banks without trees or other soil-holding plants are signs of bank instability. A sloping bank covered with vegetation is more stable and indicates a healthier watershed. Not only do gently sloping banks offer better habitats for wildlife near the water's edge, they work to slow and filter watershed runoff.

So what determines whether a stream's bank is stable or not? Factors that can impact the stability of stream banks include:

- Channelization – Stream straightening means water moves faster so the stream can have extremely high flow at certain times during the year, often producing cut banks.
- Soil Types – The type of soil that the stream channel is cutting through will affect bank appearance. A stream cutting through soft **loamy soil** tends to produce eroding cut banks. A more stable soil such as clay usually will result in more stable **slopes**.
- Vegetation – A plant community of native **wetland** plants such as willow thickets at the water's edge will prevent or slow cut bank erosion, whereas row crop to the edge of a stream will increase erosion.
- Livestock – Cattle are one of the most erosive forces along stream banks, especially along "cow paths" or watering places.
- **Tiles** – Drainage tiles and storm sewer outlets can cause erosion at their outlets.

Cutbank - Eroding

Cutbank – Vegetated

Sloping Bank

Sand/Gravel Bar

Rip-Rap

Drainage Ditch

Reporting Technique: Record the condition of both left and right stream banks as you face upstream at your site's *stream transect*.

Canopy Cover

Canopy cover influences the amount of light that can filter through overhead vegetation before reaching the stream. It is made up of vegetation (tree branches, leaves, grasses, etc.) that hang over the stream. The canopy can help protect the stream from extreme fluctuations in water temperature.

If the canopy of a stream is reduced or eliminated, the health of the stream suffers. Elevated water temperatures resulting from solar heating may directly affect aquatic life. Warm water holds less dissolved oxygen than cold water, and thus reduces the oxygen available for fish and other aquatic life. Like clouds in the atmosphere, the canopy cover helps regulate fluctuations in water temperature. Without a good canopy cover, a stream's water temperature can fluctuate greatly and stress aquatic communities.

0-25 % Canopy Cover

25-50 % Canopy Cover

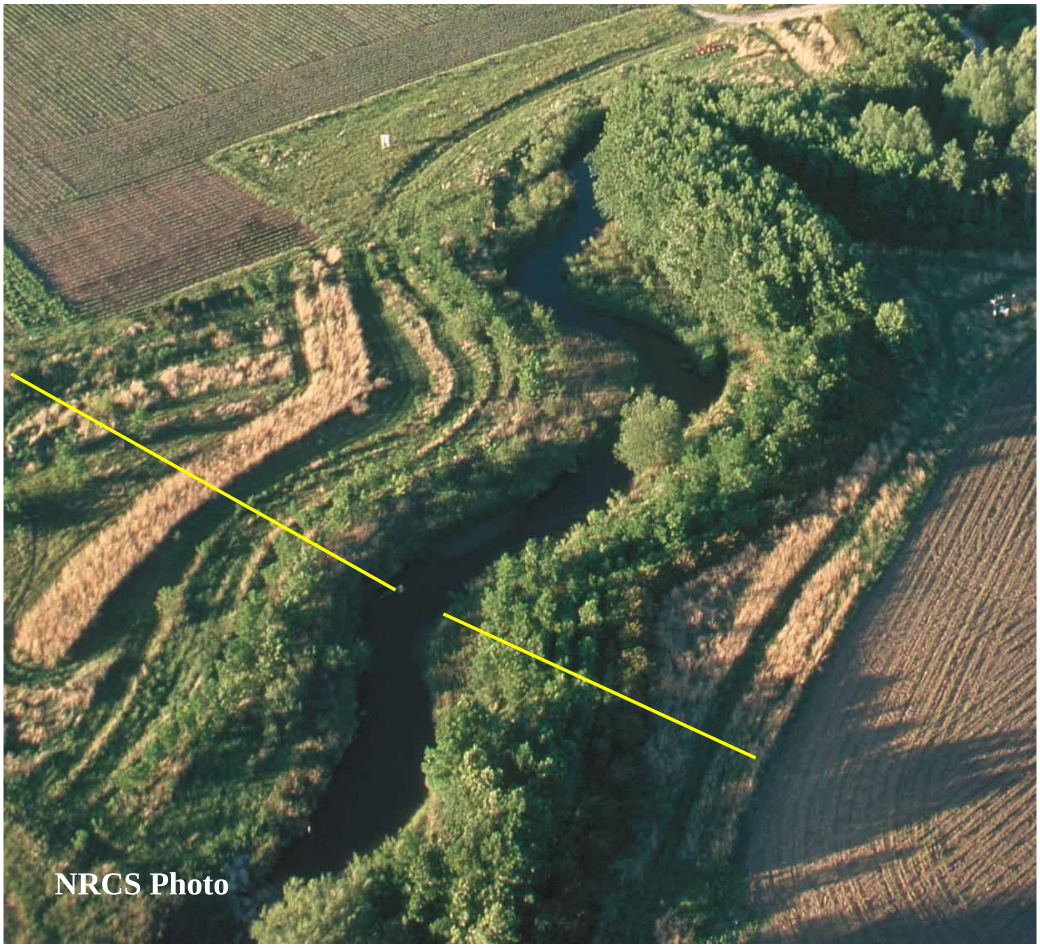
50-75 % Canopy Cover

75- 100 % Canopy Cover

Reporting Technique: At your *stream transect*, estimate **canopy cover** by what percentage of the area above the stream is covered by tree branches, leaves and/or grasses. Use your best estimate in 25% increments. If the trees do not have leaves on them, estimate the cover as if they did.

Riparian Zone

The stream's **riparian** zone is the area of land that is in “natural” vegetation directly adjacent to the stream banks. A healthy riparian area consists of trees, shrubs, and/or grasses. This zone is extremely important to the health and protection of the stream. This can include a planted buffer. Trees help stabilize the bank during flood events and may provide habitat for both aquatic and terrestrial organisms. Shrubs, grasses, and other plants can slow and filter runoff water before it enters the stream.



Planted Buffer Strip
Both Banks: Over 25 meter Riparian Zone
The yellow lines indicate the extent of the planted vegetation of the riparian zone

Both Banks: 0-5 meter Riparian Zone;
100% Grass/ Low Plants

Left Bank: 5-25 meter Riparian Zone;
85 % Grass/ Low Plants & 15% Trees

Both Banks: 0-5 meter Riparian Zone;
100% Grass/ Low Plants

Left Bank: 5-25 meter Riparian Zone;
25% Trees, 10% Shrubs/Low Trees & 65% Grass/Low Plants
Right Bank: Over 25 meter Riparian Zone;
2% Trees & 98% Grass/Low Plants

Test Yourself- How wide is the Riparian Zone? What is the Plant Cover of both banks?

Reporting Technique – each of the following should be measured at the *stream transect*:

- **Riparian Zone Width** – Facing upstream, estimate the width of the riparian zones along the **left** and **right banks** in increments of 0-5 meters, 5-25 meters, and over 25 meters. Consider the question "How wide is the "natural" buffer"?
- **Riparian Zone Plant Cover** – Facing upstream, estimate the percentage of plant cover (trees, shrubs, grass/low plants, other) in the left and right bank riparian zones. The percentages of each bank should add up to 100%.

Land Uses

It is important to document the land uses in the watershed that might influence water quality, especially those that exist in close proximity to your stream reach. Feedlots, wastewater treatment facilities, or city storm sewers can be sources of nutrients to nearby waters. Other important influences could include golf courses, roadways, parking lots, construction zones, dump sites, airports, and state or federally protected natural areas.

Adjacent Land Use - Wetland

Adjacent Land Use – Row Crop

Adjacent Land Use – Boating Access

Adjacent Land Use – Rural Residential Area


Adjacent Land Use - Pasture


Adjacent Land Use - Prairie


Adjacent Land Use - Urban


Adjacent Land Use - Park

Adjacent Land Use – Animal Feed Lot

Adjacent Land Use - Industrial

Adjacent Land Use – Steep Slopes

Adjacent Land Use – Stairs/Walkway

Reporting Technique – Check all those that apply along the *stream reach*:

- **Adjacent Land Use** – Check all land uses that you can see in the area adjacent to the riparian zones that apply. If you know of land use practices in the watershed that are upstream of your site but not immediately adjacent to your stream reach you can list and describe them in the "Record all other land use practices that potentially could affect the stream" section of the field form.

Human Use

Documenting human use, or even evidence of human use, is beneficial as it can help illustrate our physical connections to our aquatic resources.

Human Use - Swimming

Human Use - Fishing

Human Use - Wading

Human Use - Tubing

Human Use - Canoeing

Human Use – Kids Playing

Evidence of Human Use – Streamside Road

Evidence of Human Use – Livestock Watering

Evidence of Human Use – Evidence of Kids Play
Shoes along stream

Evidence of Human Use – Evidence of Kids Play
Toys in stream

Evidence of Human Use – Evidence of Kids Play
Drawings & mud balls under bridge

Evidence of Human Use – Footprints

Evidence of Human Use – Fire Pit

Evidence of Human Use – ATV Tracks

Evidence of Human Use – Fishing Tackle
Trotline

Evidence of Human Use – Fishing Tackle
Fish or Turtle Trap

Reporting Technique – Check all those that apply along the *stream reach*:

- **Human Use Activities** – Please check all activities you've either witnessed or participated in at this site.
- **Evidence of Human Use** – If there's any evidence of others using the stream, please check all uses that apply.

Defining Your Stream: Perennial and Intermittent Stream Classification

Iowa has many water bodies, ranging from large rivers, lakes, and wetlands to the vast network of small streams. Water bodies do not need to be large to support aquatic life, nor do they need flowing water throughout the year to provide enough habitat for plants and animals. In Iowa, stream segments are classified as either "perennial" or "intermittent," classifications that are based primarily on flow regimes of particular stream segments. Perennial streams have water nearly all of the time while intermittent streams tend to dry up on an annual basis.

Perennial streams *can be defined as a body of water flowing in a natural or human-made channel year-round, except during periods of drought*. Lakes and ponds that form the source of a perennial stream or through which a perennial stream flows are all characteristics of the stream. Generally, the water table is located above the streambed for most of the year and groundwater is the primary source for stream flow. In the absence of pollution or other human-made disturbances, a perennial stream is capable of supporting a variety of aquatic life. The wet season, which is typically March through May, represents the optimum time period during which you will be able to observe biological species under normal flow conditions. A stream that contains normal flow during the dry period is likely to be a perennial stream assuming that there are normal precipitation conditions.

Intermittent streams *contain flowing water for only part of the year*. During the dry season and periods of drought, these streams will not exhibit flow and are often completely dry. The flow of intermittent streams is influenced by many factors, both natural and human-made. The stream may be located above the water table, and therefore lacks the continuous presence of groundwater that provides flow within perennial streams. Human modification to the stream channel or the watershed may also disrupt the flow. In the absence of external limiting factors, such as pollution and human modification of the hydrology, there is a low diversity of aquatic organisms, and those present are tolerant to the constantly fluctuating conditions. The dry season, which is July through September, represents the ideal time to observe low-flow conditions. A stream that is observed to have no flow from the months of July through September is likely to be an intermittent stream section assuming that there were normal rain events throughout the year.

Intermittent streams may be particularly important as nursery areas for fish and amphibians because these sites support fewer predators than perennial channels. Some species may rear in the intermittent channels and then move downstream when they grow large enough to protect themselves. Because intermittent channels form a high proportion of the channel system, they can strongly influence downstream ecosystems through the input of sediment, water, woody debris, and nutrients to the rest of the channel system. These channels are also important contributors to downstream plants and animals.

Understanding the functions that intermittent streams serve can help Iowa fulfill its obligation to the Clean Water Act. One of the problems that we face as a state is a lack of data on many of our stream miles. Data gathered by IOWATER volunteers helps fill in gaps, and by providing information on these smaller, headwater, and oftentimes intermittent streams, the state can more accurately assess the status of our waters and move forward with field methodologies and protocol that will help ensure healthy aquatic systems well into the future.

Reporting Technique:
Once you are familiar with your stream, please classify it based on the above definitions on the IOWATER database.

Photographs

As the old adage goes, *a picture can be worth a thousand words*. Photographic documentation of stream habitat conditions along your stream reach is strongly encouraged and may prove to be extremely useful over time. You can upload photographs of your site to the IOWATER online database. These are extremely useful for tracking changes over time. Be sure to use landmarks to identify specific locations, so you can compare images from year to year.

To upload photographs to the IOWATER database, they must be in either JPEG (recommended) or GIF format; less than 1MB (1025kb) in size; and the photograph filename (including the file extension) needs to be less than 40 characters. It is also recommended that photos have a resolution of 300 dpi (dots per inch).

For technical assistance with resizing and uploading electronic photographs, please contact IOWATER.